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Reinforcement of Leadership Behavior in Group Discussion

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The purpose of the present study was to determine whether the use of a sociometric questionnaire about leadership in a group discussion situation influenced the effectiveness of reinforcement of leadership behavior in that situation. A procedure similar to that used by Hastorf (1965) was used, in which a target person (TP) was reinforced for leadership behavior, but with only half the groups having an early sociometric questionnaire. The results indicated that (1) The reinforcement lights exerted a significant effect on TP's proportion of talking time and his leadership status as perceived by other group members, whether or not an initial questionnaire was used. (2) The reinforcement effect on TP's talking time and leadership status was greater during the reinforcement session than during the extinction session, but a significant effect remained in the extinction session. (3) Presence or absence of the initial questionnaire exerted no significant main or interactive effect on TP's leadership status. (4) The only significant effect of presence or absence of the initial questionnaire on TP's proportion of talking time was the survey by session interaction, with TP talking proportionately less in the extinction than in the reinforcement session for both reinforced and nonreinforced groups. (5) A suggested interpretation of this effect of the survey was made, involving heightened motivation for participation by ascendant subjects in the no-survey groups in the extinction session, resulting from their just having had the questionnaire for the first time, which would at that time emphasize for them that the experimenter was interested in leadership.

Oakes, Droge, and August (1960) developed a procedure for reinforcing individual behavior in a group discussion situation. Essentially, this procedure involves the presentation of signal light flashes to individual subjects by means of a hooded panel, such that the light flash is visible only to the individual subject. The reinforcing character of the light flash is established through instructions given to the subjects. Oakes *et al.* demonstrated that the presentation of light flashes established as positive or negative reinforcers through instructions increased or decreased, respectively, the participation of the subjects in group discussion.

In subsequent studies using this procedure, Oakes *et al.* (1961)

showed that conclusions reached by individual subjects in group discussions could be influenced by this reinforcement procedure; that not all response classes were equally conditionable (Oakes, 1962a); and that the prestige value of the presumed source of the signals influenced the reinforcing effect of the signals (Oakes, 1962b).

Using essentially the procedure developed by Oakes *et al.*, Hastorf (1965) showed that the perceived leadership status of one of the participants in such a group discussion could be influenced through reinforcement of his participation in the discussion. In the Hastorf study subjects discussed one case history without reinforcement, then ranked the group members on a sociometric questionnaire. The third-ranked subject in the group of four, on the basis of that questionnaire, was then taken as the target person (TP). The group then discussed a second case, with the TP receiving a positive light flash for verbalization and a negative light for nonparticipation (Hastorf had a green positive and a red negative light in each individual subject's hooded panel). The three nontarget persons (NTPs) got positive lights whenever they made statements agreeing with TP and negative lights when they verbalized otherwise. The sociometric questionnaire was again used at the end of the second discussion, in which the reinforcements were presented. This was followed by a third discussion in which no lights were used, at the end of which the sociometric questionnaire was presented a third time.

Hastorf's results indicated that the sociometric status of TP as perceived by NTPs increased significantly after the reinforcement session, with only a slight decline after the extinction session. The same was true of the proportion of verbalization attributable to TP. The findings of the Hastorf study have important implications for the study of leadership and suggest many questions for further research.

Methodological questions are raised, however, regarding the possible reactive nature of the sociometric questionnaire and a possible confounding due to the wording of the questionnaire itself. The four questions on which subjects were to be rated were as follows: Who would you say was the group's leader? Who would you say talked the most? Who would you say had the best ideas? Who would you say did the most to guide group discussion?

It is conceivable that such a questionnaire might focus the attention of the subjects on such matters, or provide demand characteristics (Orne, 1962), which could produce or enhance the effect obtained. Furthermore, what is referred to as sociometric status by Hastorf is confounded by the second question on the survey, which deals with "who talked the most." Actually it is only the remaining three questions that deal with status.

It is conceivable that the effect of the signal light reinforcement was to increase TP's verbalization, and that this did not enhance TP's leadership status as perceived by the NTPs in the group. Since the rank of TP on the question, "Who would you say talked the most," was included by Hastorf in an amalgam index of "sociometric status," the enhanced sociometric status reported could be simply the result of TP talking more. Thus in the present study the questions covering leadership status are analyzed separately from the one concerned with amount of talking.

In order to assess the possible reactive nature of the questionnaire, in the present study the prequestionnaire, i.e., the one given after the initial discussion but before the reinforcement session, was used in only half the groups. Thus comparisons can be made of subjects possibly sensitized by the questionnaire and those not.

Hastorf reported a very high correlation between amount of subjects' verbalization and the sociometric ranking. In half the groups of the present study no initial sociometric questionnaire was used; in these groups TP was chosen on the basis of amount of participation. In the other half the questionnaire was used. Otherwise the procedure for the groups was the same. Another independent variable manipulated was the use of lights, i.e., the presentation of reinforcements. Thus four sets of groups were used, two sets receiving light reinforcement and two sets not receiving light reinforcement. And, in an orthogonal design, two sets received the initial questionnaire and two sets did not receive the questionnaire.

METHOD

Subjects

Fifty-six four-person groups were used. The 224 subjects were volunteers from introductory psychology classes at the University of Hawaii. They were assigned at random to one of four conditions: survey, lights (SL); no survey, lights (NSL); survey, no lights (SNL); and no survey, no lights (NSNL).

Procedure

The experimental procedure used was essentially that of Hastorf (1965). For all groups the experiment was divided into three parts or sessions. The first or operant session was a ten-minute discussion of a human relations problem. At the end of the operant session a sociometric questionnaire was administered to groups in the Survey condition. The questionnaire consisted of the following items, on which all participants were to be ranked: (a) Who would you say was the group's leader? (b) Who would you say talked the most? (c) Who would you say had the best ideas? and (d) Who would you say did the most to guide group discussion? This questionnaire was omitted following the operant discussion for the No Survey condition.

The TP was chosen by selecting the person ranked third on the questionnaire, or the person ranked third in speaking time in the No Survey condition.

A twenty-minute discussion on a second human relations problem followed. This was called the reinforcement session. In the reinforcement session for all groups in the Lights conditions, TP received positive (green) light flashes, indicating reward, for verbalization, and negative (red) light flashes, indicating punishment, for silence. NTPs received negative lights for excessive verbalization or for expressing opinions, and positive lights for agreeing with TP. The questionnaire was administered to all groups at the conclusion of the reinforcement session.

A third ten-minute discussion, called the extinction session, on a third human relations problem followed. No lights were expected or delivered during the extinction session. Its purpose was to determine whether the effect of the previous reinforcement persisted into this period. All groups received the questionnaire at the conclusion of this session.

For each group the experiment began with subjects being escorted from a common Subjects' Waiting Room to the experimental room by the second author, and being seated in alphabetical order around the table. Each subject had a panel containing a red and a green light, visible only to him, before him on the table. The room was equipped with a one-way-vision glass between the experimenters' room and the subjects' room, an intercom system, and a microphone connected to one channel of a stereo tape recorder in the adjacent experimenters' room. The subjects were read the following instructions:

> "I am Dr. Oakes, your experimenter. This is a study to assess the ability of psychology students to solve human relations problems. This is a completely programmed experiment in which you will use, in sequence, the folders before you. Additional instructions will come to you by way of the intercom. You will find your first sheet of instructions in folder A. Please follow these instructions carefully. Do not go on to additional sheets or folders until you are told to do so. These instructions are self-explanatory. I can answer no questions about them. If you do have any questions, please read the instructions again. At certain times during the experiment my graduate assistant will come into the room to pick up questionnaires that you have completed. Please fill out these questionnaires quickly and promptly. You may now open folder A. Read the instructions only. I'll be in the control room where I can monitor your discussion."

Before each subject was a stack of three folders marked A, B, and C. In order, within folder A were instructions (A), the human relations problem to be discussed, and the sociometric questionnaire if it was under the Survey condition. In folder B were instructions (B) for the Lights condition, the second problem, and the questionnaire. In folder C were instructions (C), a third human relations problem, and the final questionnaire.

Instructions (A) read as follows:

> "Please read these instructions carefully and be sure that you understand them. Beneath this sheet is a human relations problem taken from the files of our Social Psychology Laboratory. You are asked to discuss this problem in terms of the complications which might arise and the solutions which might be attempted. Also discuss the individual or group dynamics that might be involved.

"I am Dr. Oakes, a professional psychologist. I, along with a panel of human relations experts, will be monitoring the discussion from another room. In this experiment it is necessary that you identify yourself each time you speak. Use no names for this identification. Instead, identify yourself by the letter of your position (located in front of you) each time you speak. Do it this way: Say 'I'm W . . . ,' or 'West, I think . . . ,' etc. Please do not discuss anything else except that which pertains to the human relations problem itself.

"When I flash both of your lights, begin to read the human relations problem in this folder. When I flash your lights a second time begin the discussion. The discussion will last ten minutes."

Instructions (B) were used only in the Lights condition. In the No Lights condition verbal instructions were given by way of the intercom. Instructions (B) read as follows:

"In this folder is a second human relations problem. Dr. Oakes and the human relations panel will again monitor your discussion, but this time they will let you know how you're doing. Whenever you make a contribution to the discussion which is helpful or functional in facilitating the group process your green light will go on. Whenever you behave in a way which will eventually hamper or hinder the group process your red light will go on. Do not mention the fact that you have received a green or red light or no light at all. Furthermore, do not make any attempt to observe the lights of any of the other participants. Again identify yourself by position before you speak. Begin reading the human relations problem in this folder when both your lights flash. When they flash a second time begin the discussion. You will have twenty minutes for this discussion."

Instructions (C) read as follows:

"In this folder is a final human relations problem. This is not a feedback session. However, the panel will still monitor your discussion. Remember to identify yourself before you speak. When both lights flash begin reading the human relations problem in this folder. When they flash a second time begin the discussion. This discussion will last ten minutes."

The first author entered the experimental room to collect questionnaires as they were completed. Other contact with the subjects was by way of the intercom. At appropriate times subjects were told when the discussion had been completed, when to complete questionnaires, when to close folders, and when to go on to the next folder.

For subjects in the No Lights condition, in place of the written instructions (B), subjects were told to read the next problem in anticipation of a discussion that would last twenty minutes. Flashing of both lights signaled the beginning of the discussion.

At the conclusion of the experiment the subjects were asked not to discuss the experiment either among themselves or with others, and were told that the results would be made available to them at a later date.

In the control room the experimenter controlled the intercom, the lights for each subject, clocks that recorded the length of speaking time for each subject, and a stereo tape recorder. Whenever reinforcements were presented, the experimenter noted this by speaking into his microphone and recording this on the second chan-

nel of the stereo tape recorder. Thereby a permanent record of the position, type, and time of reinforcement was obtained.

RESULTS

The data obtained during the experiment included the sociometric ratings of the TP made by the NTPs, the total speaking time of each subject for each of the sessions, and a tape recording of the entire discussion. Analyses of variance were made using the mean of the ratings for each TP by the three NTPs in his group at the end of the reinforcement and extinction sessions under the various conditions. The first analysis used the ratings on all four questions, while the second

TABLE 1
SUMMARY OF ANALYSIS OF VARIANCE OF TP MEAN SOCIOMETRIC RANKINGS ON THE SUM OF THE FOUR SOCIOMETRIC QUESTIONS

Source	*df*	*MS*	*F*
A (Lights)	1	8.14	8.66**
B (Survey)	1	0.03	—
AB	1	0.75	—
Error between	52	0.94	
C (Session)	1	0.17	1.13
AC	1	0.47	3.13*
BC	1	0.16	1.07
ABC	1	0.03	—
Error within	52	0.15	

* $p < .10$.
** $p < .01$.

involved only the three items that were concerned with leadership status. In both cases this resulted in a three-factor mixed model analysis of variance, the between-subjects treatments being reinforcement (A) (L versus NL), and survey (B) (S versus NS). The within-subjects treatment was session (C) (reinforcement session versus extinction session). Table 1 presents the results of the analysis using all four questions as Hastorf (1965) did.

It can be seen from Table 1 that there was a significant main effect of Lights ($F = 8.66$, 1 and 52 *df*, $p < .01$), and the suggestion of an interaction between Lights and Session ($F = 3.13$, 1 and 32 *df*, $p < .10$). This situation was further clarified when this same analysis was made using the questions dealing only with status. Table 2 presents the summary of that analysis.

The analysis of the results on the status questions again showed a significant effect of Lights ($F = 7.13$, 1 and 52 *df*, $p < .01$); however, in this analysis the Lights by Session interaction was clearly significant

($F = 4.38$, 1 and 52 *df*, $p < .05$). A comparison of TP mean ratings shows that ratings for the Lights groups were significantly higher than those for the No Lights groups at the conclusion of the reinforcement session ($t = 3.19$, 54 *df*, $p < .01$), and that this difference, although considerably reduced, was still significant at the conclusion of the extinction session ($t = 2.06$, 54 *df*, $p < .05$).

The percentage of talking time of TP was chosen as the most convenient and economical participation measure, after a preliminary analysis had shown a very high correlation between it and the total number of words spoken by each subject, which would be a more precise measure

TABLE 2
SUMMARY OF ANALYSIS OF VARIANCE OF TP MEAN SOCIOMETRIC RANKINGS ON THE THREE QUESTIONS INDICATING STATUS

Source	*df*	*MS*	*F*
A (Lights)	1	6.77	7.13**
B (Survey)	1	0.02	—
AB	1	0.88	0.93
Error between	52	0.95	
C (Session)	1	0.32	2.00
BC	1	0.17	1.06
AC	1	0.70	4.38*
ABC	1	0.17	1.06
Error within	52	0.16	

* $p < .05$.
** $p < .01$.

of participation. Correlations between these two measures in each of the three sessions for members of six groups chosen at random were .96, .95, and .91 for the operant, reinforcement, and extinction sessions, respectively.

Table 3 presents the summary of an analysis of variance of the percentage of talking time, which again is a three-factor mixed model design. It can be seen that the effect of the Lights was significant ($F = 7.97$, 1 and 52 *df*, $p < .01$). Moreover, the interaction between Survey and Session was also significant ($F = 4.34$, 1 and 52 *df*, $p < .05$).[1]

Inspection of the cell values for the significant Survey by Session interaction shows that in the reinforcement session TP's proportion of talking time was the same whether or not his group had the initial survey

[1] An analysis of covariance, in which the operant session value was used as a covariate, was also made, but except for increasing the value of F for reinforcement ($F = 15.71$, 1 and 51 *df*, $p < .001$), the results were essentially the same as with the analysis of variance.

TABLE 3
SUMMARY OF ANALYSIS OF VARIANCE OF PERCENTAGE OF SPEAKING TIME FOR TARGET PERSONS

Source	*df*	*MS*	*F*
A (Lights)	1	1511.16	7.97**
B (Survey)	1	230.87	1.22
AB	1	58.29	—
Error between	52	189.53	
C (Session)	1	121.39	2.56
AC	1	113.21	2.38
BC	1	206.28	4.34*
ABC	1	31.29	—
Error within	52	47.51	

* $p < .05$.
** $p < .01$.

(although, of course, the reinforced TP talked more than the nonreinforced TP). In the extinction session, however, TP's proportion of talking time in groups without the initial survey was considerably less than it had been in the reinforcement session (although again, of course, the reinforced TP talked considerably more than the nonreinforced TP). Although the triple interaction was not significant, inspection of those

TABLE 4
MEAN PERCENTAGE OF SPEAKING TIME FOR TARGET PERSONS

Group	Operant	Session	
		Reinforcement	Extinction
SL	13.8	26.2	25.9
NSL	13.2	25.6	17.8
SNL	17.2	16.4	18.0
NSNL	13.2	16.7	14.9
Σ Survey	31.0	42.6	43.9
Σ No Survey	26.4	42.3	32.7
Σ Lights	27.0	51.8	43.7
Σ No Lights	30.4	33.1	32.9

cell values suggests that the decrease in TP's proportion of talking time from reinforcement to extinction session for groups *without* the initial survey was *less* for the nonreinforced than for the reinforced TP, while the increase in TP's proportion of talking time from reinforcement to extinction session for groups *with* the initial survey is *greater* for the nonreinforced than for the reinforced TP.

Table 4 presents the mean percentage of talking time for TPs under the various conditions and sessions.

DISCUSSION

The results of all analyses show a significant effect of reinforcement lights on both talking time and the sociometric status of TPs. Sociometric status was not appreciably changed when the effect of the alien question on the survey was removed. However, when the results from this question were left out of the analysis, a clear interaction between Lights and Session was noted. A comparison of group mean ratings revealed that a powerful reinforcement effect due to the lights was obtained at the end of the reinforcement session, and that this effect was considerably lessened at the end of the subsequent extinction session. Although in this latter case the difference between the group means is decreased, the reinforcement effect is still significant.

The significant effect of reinforcement is again evident when the percentage of talking time is taken as the dependent variable. In this case, however, the results provide support for the notion that the initial questionnaire is somewhat reactive. It does not seem that the initial questionnaire is reactive in the simple sense in which we had initially anticipated it might be, i.e., that the reinforcement effect was dependent on sensitization by an initial questionnaire. This sort of sensitization would have produced a significant reinforcement by survey interaction, or, possibly, a significant triple interaction of reinforcement, survey, and session. What was found instead was an effect of the initial survey on both the reinforced and nonreinforced TPs. Further, it seems to be somewhat of a sleeper effect, such that the survey and no-survey TPs talk about the same amount during the reinforcement session, but only the no-survey TPs show a decrease in percentage of talking time in the extinction session. Thus the effect of the initial survey is to keep TP's proportion of talkiing time from dropping off in the extinction session, but this is true for both the reinforced and nonreinforced TPs. This sort of reactivity of the survey is somewhat more difficult to understand than the simple interaction of survey with reinforcement that we had originally anticipated as a possibility.

Looking at the differences in the situation for the survey and no-survey groups at the time of the extinction session, we see that whereas the survey groups had been led (by the initial questionnaire) to believe that the experiment was concerned with leadership before the second (reinforcement) session, the no-survey group had probably not realized this until their first questionnaire was presented, after the reinforcement session and immediately before the extinction session. Subjects in these no-survey groups thus realized, after having discussed two cases, that the experimenter was concerned with who the group leader was.

who talked the most, etc. It is conceivable that such realization could provide increased incentive, especially for the more ascendant subjects in the group, i.e., those ranked first and second in talking time on the initial session, to participate more in the discussion. This would have the effect of producing during the final session a decrease in proportion of talking time for TP, who was initially third-ranked in talking time. If this is what did produce the effect, we would expect to find an increase in proportion of talking time for the initially first-ranked subjects in the no-survey groups from reinforcement to extinction session, and we would also expect to find a decrease in proportion of talking time of TP in the survey group without reinforcement from operant session to reinforcement session. We would expect this decrease in TP's proportion of talking time in group SNL from operant to reinforcement session because this is the point at which the initial questionnaire would lead that group to realize that the experimenter was concerned with leadership. It can be seen from Table 4 that the expected decrease did occur for group SNL. (We would not expect a comparable decrease for group SL, since the reinforcing lights were working in opposition to such an effect for that group during the reinforcement session.)

The proportion of talking time attributable to the initially first-ranked subjects in the no-survey groups in the reinforcement and extinction sessions is shown in Table 5.

TABLE 5
MEAN PROPORTION OF TALKING TIME OF SUBJECTS INITIALLY RANKED FIRST IN NO-SURVEY GROUPS

	Session	
Group	Reinforcement	Extinction
NSNL	42.98	48.15
NSL	35.60	44.07

It can be seen from Table 5 that the expected increase in proportion of talking time did occur from the reinforcement to extinction sessions for these no-survey groups.

The above suggested interpretation of the significant survey by session interaction remains, of course, only a suggestion, as the *post hoc* data analysis cannot establish its validity. It does seem a reasonable interpretation of the results, however.

Thus the findings of the present investigation may be summarized as follows:

(1) The reinforcement lights exerted a significant effect on TP's pro-

portion of talking time and his leadership status as perceived by other group members, whether or not an initial questionnaire was used.

(2) The reinforcement effect on TP's talking time and leadership status was greater during the reinforcement session than during the extinction session, but a significant effect remained in the extinction session.

(3) Presence or absence of the initial questionnaire exerted no significant main or interactive effect on TP's leadership status.

(4) The only significant effect of presence or absence of the initial questionnaire on TP's proportion of talking time was the survey by session interaction, with TP talking proportionately less in the extinction than in the reinforcement session for both reinforced and nonreinforced groups.

(5) A suggested interpretation of this effect of the survey was made, involving heightened motivation for participation by ascendant subjects in the no-survey groups in the extinction session, resulting from their just having had the questionnaire for the first time, which would at that time emphasize for them that the experimenter was interested in leadership.

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